DEVELOPMENT OF OCEANOGRAPHIC SOFTWARE TOOLS AND APPLICATIONS FOR NAVY OPERATIONAL USE

James H. Corbin
Center for Air Sea Technology
Mississippi State University
Building 1103 - Room 233
John C. Stennis Space Center, MS 39529-6000
Phone: (228) 688-2561 Fax: (228) 688-7100 email: corbin@cast.msstate.edu
Award #: N00014-97-1-0116

LONG-TERM GOALS

The objective of this project was to transition to NAVOCEANO, FNMOC, and NRL several software applications developed with ONR 6.1/6.2 funding and other leveraged contract sources.

OBJECTIVES

As noted in the work completed section below, funding for this project was unexpectedly reduced by 50 percent in mid-FY97. As a result, the objectives, which had encompassed several CAST developed software applications, were significantly reduced. Accordingly, the CAST objective for FY97 was to develop interactive graphical tools for shipboard METOC briefers. This was in response to a COMSIXTHFLT validated METOC requirement to provide visualization briefing tools, animations, and 3–D graphical depictions of weather features and tactical impacts. Included was the development of an architecture to integrate weather graphics with Navy tactical decision aids.

APPROACH

The basic CAST premise is to consider operational requirements in the development of an integrated working environment for ocean modeling research. This objective requires a continuing dialog with operational Navy personnel and members of the ocean research and information sciences communities to understand requirements, to develop solutions that resolve them, and to remain abreast of technological progress.

All CAST software systems are designed for integration. They incorporate (1) a browsing capability which fulfills the database search and retrieval functionality represented by the CAST BROWSER, (2) interactive editing and analysis of ocean profiles, model output and satellite imagery embodied in the Interactive Data Editing and Analysis System (IDEAS) and the Navy Interactive Data Analysis System (NIDAS), and (3) both objective and subjective comparisons and evaluations of model output and other datasets as supported via the CAST Model Evaluation System (CMES).

Originally, CAST systems were based on the premise that any information needed by an application could be stored as primary data or metadata in a relational database management system (RDBMS). Recently, CAST contributions to the Master Environmental Library (MEL) project have extended this concept to storage of metadata in flat files wherein accessibility by all software applications is simplified, leading to increased flexibility and expanded functionality. Our

Report Documentation Page

Form Approved
OMB No. 0704-0188

1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED
30 SEP 1997		**00-00-1997 to 00-00-1997**

4. TITLE AND SUBTITLE	5a. CONTRACT NUMBER
Development of Oceanographic Software Tools and Applications for Navy Operational Use	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)	5d. PROJECT NUMBER
	5e. TASK NUMBER
	5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **Mississippi State University,Center for Air Sea Technology,John C. Stennis Space Center,MS,39529**	8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR'S ACRONYM(S)
	11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution unlimited

13. SUPPLEMENTARY NOTES

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT **unclassified**	b. ABSTRACT **unclassified**	c. THIS PAGE **unclassified**	**Same as Report (SAR)**	**5**	

work in developing the Real Time Wave Forecasting (RTWF) interface for the Army Corps of Engineers has demonstrated that innovative management of metadata, as it relates to ocean models, is a key factor in achieving relocatability. By treating the model as a modular element, we have developed a graphical user interface (GUI) that supports the management of input/output, definition of boundary conditions and tuning of initialization parameters for rapid relocation. The RTWF design applies this interfacing technique to nested wave and surf models.

The primary software applications to be transitioned in this project are: (1) Weather Watch, (2) NIDAS, (3) CAST Model Evaluation System, (4) Integrated Tides/Wave/Surf Model GUI, (5) Relocatable Ocean Circulation Models, (6) Bathymetries from Remotely Sensed Information, and (7) Enhancements of the Environmental Visualization System. These are discussed briefly in the following paragraphs.

Weather Watch (WW) has been developed as a briefing tool for the Tactical Environmental Support System (TESS). It was originally developed and transitioned in FY95. In FY96, CAST integrated the WW components into a fully object oriented framework or Extensible Dynamic GUI Environment (EDGE), interfaced the application to the TESS Tactical Environmental Database (TEDS) and NITES, and added the capability to automatically generate products as data is received. Major WW Version 2.0 components include the Object Manager, Brief Maker, Chartwall Editor, Database Manager and Animator.

NIDAS is an application that allows an expert user to generate synthetic high resolution oceanographic datasets for coastal and shallow water areas. Phase I of the NIDAS project was "hardwired" to the Persian Gulf and has been transitioned to NAVOCEANO. Phase II added capabilities to support its relocatability on short notice to any region of the globe and was also transitioned to NAVOCEANO, and it included several new data types and enhancements to system functionality. Phase III of NIDAS consisted of upgrades and increased functionality. The work planned for FY97 was to modify and reconfigure selected NIDAS III functional components for interface with the NAVOCEANO Comprehensive Environmental Assessment System (CEAS) in preparation for implementation at Commander, Mine Warfare Command (COMINEWARCOM). In addition, NAVOCEANO had established requirements for additional data types and extended data selection capabilities as part of the basic NIDAS III application. Enhancements to NIDAS would include those based on user feedback and conversion to the EDGE/CORBA distributed object environment.

Model evaluation, as envisioned by the CNMOC Shallow Water Modeling Assessment Panel, requires specialized software tools. Many of these tools are very similar to those required by FNMOC and the NAVOCEANO Warfighting Support Center (WSC) in its day-to-day operations. The CMES, which addresses many of these needs, has been transitioned to NAVOCEANO and evaluated by FNMOC. Based on feedback, there is a need for upgrades to support additional analysis techniques, revisions in RDBMS architecture and modernization of the visualization module. By upgrading the CMES, CAST is also responding to the CNMOC Shallow Water Modeling Assessment Panel's requirements. A modified CMES GUI will allow launching of independent, stand-alone evaluation processes in a distributed computing environment enabled by Common Object Request Broker Architecture (CORBA). In addition this task will interface the CMES to the NAVOCEANO Integrated Database Management System (IDBMS).

The Integrated Tides/Wave/Surf Model GUI was based on previously developed GUI's for the 2-D tidal model and the RTWF. In this task CAST would fuse the two capabilities into a single GUI capable of supporting the 3-D tidal model and the RTWF nested wave/surf modeling

environment. The goal is to transition to NAVOCEANO a system capable of relocating tide/wave/surf modeling capability to any region on short notice in response to developing international events. The need for this capability was demonstrated during CAST support to NAVOCEANO in implementing tide forecasting capability for the coast of Liberia.

The methodologies employed in developing GUI's for tide, wave and surf models can be applied to relocatable ocean circulation models as well. By providing an interactive interface whereby initialization datasets and boundary conditions can be fine tuned to a region, we anticipate that sensitive ocean model configuration procedures can be optimally achieved, thereby decreasing the time required for testing and evaluation for a new region. Candidate models for this effort are the DieCAST and Princeton ocean models.

The resolution of bottom depth measurements have consistently fallen short of requirements on a global scale. These tools contribute to successful development of relocatable modeling environments. Furthermore, NAVOCEANO has plans to use a laser-based instrument to measure the ocean depths in shallow regions. Although this information is very accurate, it is contaminated with fluctuations caused by tidal forcing and wave effects. CAST has been approached to develop a correction capability based on the 3D Colorado University Rapidly Relocatable and Nestable Tides and Storm Surge (CURRENTSS) Model. This model assimilates tide gauge and satellite altimetry data and accurately predicts 3-D tidal components. We would apply CURRENTS model output to correct the laser-based bottom measurements; thereby producing high resolution shallow water bathymetries. The new system would contribute to successful development of relocatable modeling environments. The valuable satellite altimetry measurements will be retained in separate research quality databases for system validation and ground truth.

There are two primary aspects of planned enhancements and upgrades to the Environmental Visualization System (ENVIS). The first is to incorporate the changes identified in user feedback from NAVOCEANO. The second involves the incorporation of components of the ONR-funded Unified Air-Sea Visualization System (UASVS) Project and the DOD-funding Small Business Innovative Research (SBIR) Program with Gulf Weather Corporation into ENVIS. The work would concentrate on implementing NAVOCEANO-identified modifications.

WORK COMPLETED

The anticipated funding for this project in FY97 was $400K, however, this was unexpectedly reduced to $300K 0n 18 November 1996, and further reduced to $200K on 10 March 1997. As a result, many of the FY97 efforts, which were continuations of earlier research, were placed on hold. Accordingly, the only major task accomplished in FY97 involved modifications to the Weather Watch (WW) Software. In FY97 CAST developed a new generation object manager for WW based on EDGE architecture which featured full-scale drag-and-drop, drop-overlay functionality, graphical page configuration, the concept of a universal record locator (URL), supported the HTTP protocol, provided graphical process creation capability, an advanced solution for the UNIX "color problem", and support for 16 and 32 bit displays. CAST also developed the capability to automatically create MPEG Movies of the briefs, improved the ImgTool package, and added CCTV mode to the animator. The extensions added to WW in FY97 included implementing system access based on security levels.

RESULTS

These Weather Watch upgrades were completed and transitioned to NRL-Montery as WW Version 3.0. Also included in this effort was a continuing investigation/evaluation of object oriented databases and artificial intelligence technology for application to WW and TESS-like follow-ons.

IMPACT/IMPLICATIONS

A CAST developed weather briefing software package for the X-Graphics Workstation associated with TESS was delivered to NRL-Monterey for Navy usage. Funding for this project in FY98 has been cancelled and accordingly this software package will not be tailored for CNMOC Regional Center use in FY98. Other planned software applications will also not be transitioned.

TRANSITIONS

The Weather Watch upgrades were transitioned to NRL as WW Version 3.0.

RELATED PROJECTS

Applications of Numerical Models in the Coastal, Semi-Enclosed, and Coastal Seas Using the Relocatable Modeling Environment under ONR Grant N00014-95-1-0203.

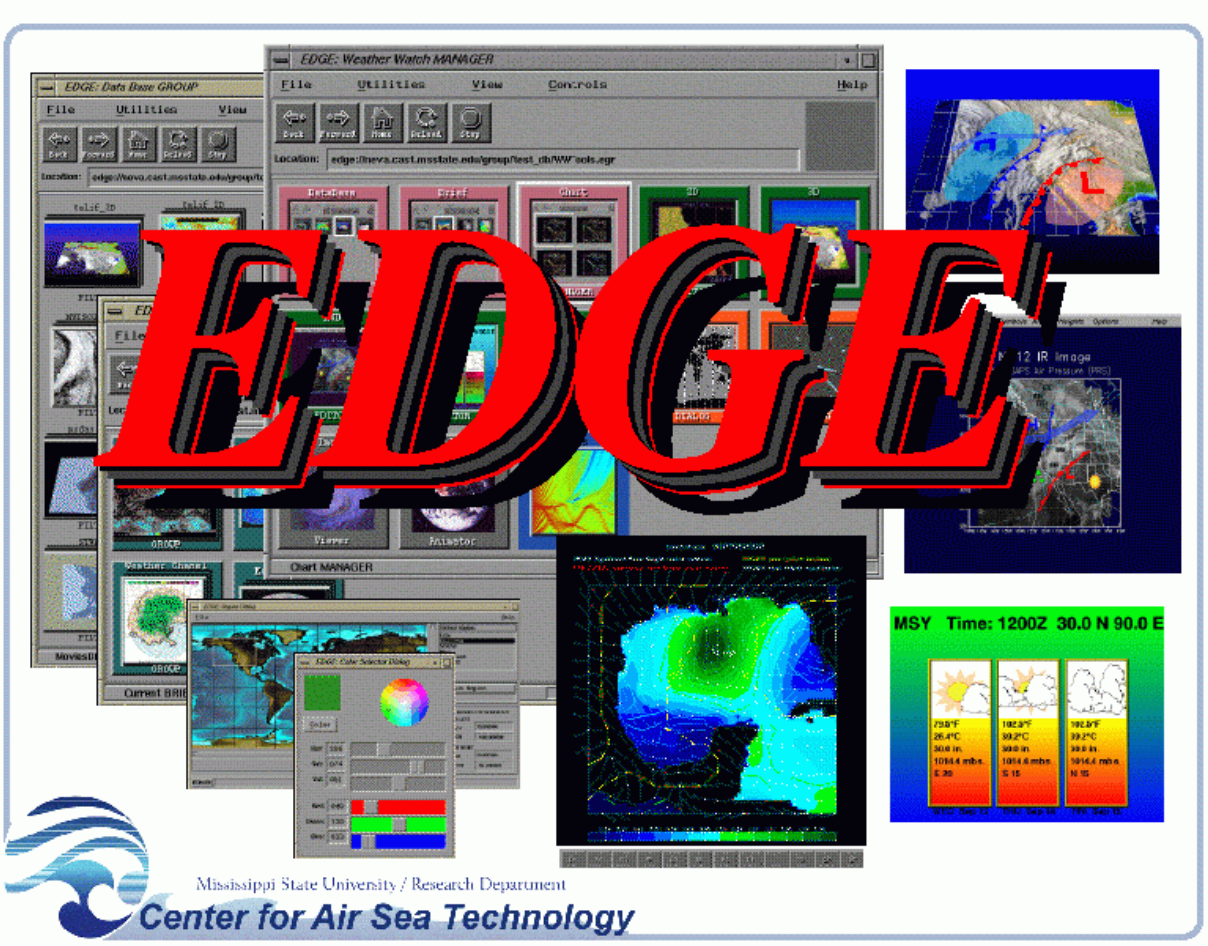
Distributed Visualization and Virtual Environment for Meteorology and Oceanography under ONR Grant N00014-97-1-0116 with the NSF-MSU Engineering Research Center.

Development of a Metadata Database for Automated Oceanographic Imagery under Subcontract to Gulf Weather Corporation DOD Small Business Innovative Research Program Contract N00014-95-C-0108.

Development and Maintenance of the Naval Interactive Data Analysis System (NIDAS) for NAVOCEANO and Commander Mine Warfare Command under NASA Contract NAS13-564 Delivery Orders 82, 96, 131, and 132.

Transition and Implementation of the Tidal Relocatable Modeling Environment (RME) at the Naval Oceanographic Office under NASA Contract NAS13-564 Delivery Order 125.

REFERENCES


EDGE
EDGE: Weather Watch MANAGER
File
Utilities
View
Controls
Help
Chart MANAGER
MSY Time: 1200Z 30.0 N 90.0 E
Mississippi State University / Research Department
Center for Air Sea Technology